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Introduction:

On December 11, 1992 a devastating nor'easter struck the North Shore of Long Island, including the Village of Bayville, and changed forever storm awareness and preparation. Following the '92 nor'easter, any significant storm event has brought about more changes so that a future storm cannot cause similar damage. An example of this can be found in actions taken by the Village of Bayville after a moon tide event in 1996.

During a relatively calm evening in October 1996, an astronomical high tide crept across the Village-owned Soundside Beach causing flooding of the east end streets. Soon afterwards, it was decided by the Board of Trustees that a berm be constructed parallel to the shoreline across the width of the beachfront. Consequently, there has not been another occurrence of flooding at this location; clearly an example of using first hand observation of a problem and putting in place the most cost effective remedy. Even prior to 1996 the Village took steps to alleviate the problems. When storm water did not drain from the low-lying east end streets the Village put in a drainage system that drains the affected area and purchased property nearby to serve as an outfall. Bayville, as a small village, has done a lot to protect its residents and their property but, as the events of Hurricane Irene in 2011 and Hurricane Sandy in 2012 prove, there is always more that can be done.

The purpose of the attached study is to provide evidence for a funding request to put in place a segment of a plan drawn up by the Army Corps of Engineers that examined the feasibility of protecting the Village by constructing a seawall or berm around various stretches of Village shoreline. After witnessing the flooding caused by both Irene and Sandy it is thought that a sheetpile wall, encased by a stone and sand berm, planted with protective vegetation along Mill Neck Creek from the Bayville Bridge on the east end and running west to Washington Avenue would stop a tidal surge.

It is this area from the Bayville Bridge to Washington Avenue that allowed the high tide from Mill Neck Creek to pour over the banks flooding the President Streets at Bayville Avenue during Irene, and with more severity during Sandy, when flood waters from the Creek were able to reach the entire east end of the Village.

There is one smaller length of beachfront on the Sound side of the Village, along an area referred to locally as Pine Lane, offering little or no resistance to northeast wind-driven storms. This area should receive a similar treatment as the one recommended for the President Streets.

What follows will explain why this course of action will:

1. Provide an increase in overall public safety.
2. Provide a sharp decrease in flood insurance claims after any future event
3. Continue to strengthen compliance with the Municipal Separate Stormwater Sewer System (MS4) under the Federal Clean Water Act.

Nothing in this presentation, except for excerpts from the Army Corps Study, is meant to substitute for professional surveying, engineering, or legal services. It is only presented as the beginning of the process of permitting and funding a project that can alleviate future losses and hardship.

Background

The U.S. Army Corps of Engineers, New York District (the “District”) in partnership with the New York State Department of Environmental Conservation and the Incorporated Village of Bayville initiated a study in 1995 to evaluate the feasibility of beach erosion control and storm damage reduction on the North Shore of Long Island.

Purpose

The purpose of the study was to identify possible solutions to the threat of hurricane and storm damage in Bayville, New York. The study was authorized by a resolution of the U.S. House of Representatives Committee on Public Works and Transportation adopted May 13, 1993. In response to a State request following the devastating coastal storm of December 1992, the District performed a Reconnaissance Study and issued a Reconnaissance Report in September 1995 that demonstrated an interest at the federal level and the need for a more detailed feasibility study. Federal, State, and local governments have agreements in place, along with the necessary funding, to initiate the feasibility phase.

Mill Neck Creek*

The shoreline of Mill Neck Creek is approximately 2,500 ft. from the western boundary of Saltaire Lane and Shore Road, to the eastern boundary of Ludlam Avenue. Except for the eastern 600 ft developed waterfront of the yacht club and marina, the rest of the bay front shoreline in the western reach are low marshlands against the existing timber bulkhead retaining wall along private properties at an average elevation of +8.5 to +10 ft NGVD.

Presented below are the benefits that would be garnered from proceeding with a relatively cost effective remedy to mitigate the flooding in those areas referred to as the “President Streets.”

Public Safety*

The shoreline of Mill Neck Creek extends approximately 2,500 ft. from the eastern boundary of Ludlam Avenue to the western boundary of Saltaire Lane and Shore Road. Tidal surges from Mill Neck Creek push the water into the President Streets and out onto Bayville Avenue. Bayville Avenue becomes flooded and impassable. In the case of Hurricane Sandy, the existing conditions helped to flood the entire east end of the Village.

During nor'easters, traveling along Bayville Avenue is difficult enough at high tide. During Sandy there was an emergency shutdown of gas service in the flooded President Streets. There were stalled vehicles, emergency personnel and utility trucks all converging at once. Had there been another emergency call, emergency vehicles would not have been able to traverse this section of the roadway for several hours after high tide.

Property Damage

The President Streets section of Bayville was impacted by tidal surges from Mill Neck Creek during Irene and Sandy. In both cases, homes were inundated by the storm surges. It is our observation that flood mitigation measures would reduce, if not eliminate, repetitive homeowner insurance claims.

The first question that is usually asked upon requesting any type of mitigation funding is about prior loss history. When referring to the flooding of the President Streets caused by the overflow of Mill Neck Creek during prior storms, the damage was limited to several blocks and not all homes in the area were affected. This changed during Hurricane Sandy when the evening storm surge entered quickly at the Creek side of the President Streets flowing eastward, deep and fast, flooding the east end of the Village. Outside of some storm water intrusion from the Pine Lane area on the Sound, it was the surge from the south that occurred when the winds changed from northeast to southeast shortly before high tide. Because of this situation we can attribute most, if not all, flood damage claimed during Sandy to water intrusion from the southern end of the President Streets.

Should another storm similar to Sandy occur the, the Village of Bayville would sustain far less damage with the proposed sheetpile wall or berm in place. Future damages averted and benefits include loss of personal property, damage to homes, reduced FEMA claims, less disruption of residents' lives and less strain on Village services that occurs when the Village must remove vast quantities of debris in the aftermath of a flooding event. Additionally, less damage to the Bayville community as a whole would result in less need for the Village to call on other agencies for assistance.

After Sandy the Village received assistance from FEMA, SEMO, Nassau County OEM and the Town of Oyster Bay, all of whom had more than enough to do aiding other communities. Constructing a sheetpile wall or berm along the southern end of the President Streets as well as the Sound side of the Pine Lane area would be a positive and proactive approach.

Municipal Separate Storm Sewer System (MS4)

The Incorporated Village of Bayville was the one of the first municipalities to implement MS4. We support all protection efforts of our fragile coastline. It is our observation that flood mitigation in the President Streets area will only enhance and support the efforts of MS4.

MS4 permitting and reporting was borne out of the Federal Clean Water Act of 1971. It currently requires that an annual compliance report be completed and places certain demands on municipalities. Among these demands are counting stormwater outfalls, performing dry weather monitoring of these outfalls to establish that no illicit discharge is present and lab testing of samples so as to comply with Total Maximum Daily Load (TMDL) of pollutants into local waterways.

The Village of Bayville is bordered on the south by Mill Neck Creek which, due to its makeup, is considered a water body that is under stress and therefore needs to have its TMDL reduced. Outside of any mandated requirements, the Village of Bayville has taken pride in its leadership role in protecting the bodies of water that surround it. Bayville was the first municipality to pass a resolution to pay dues to fund the Oyster Bay-Cold Spring Harbor Protection Committee. This group advances the common goal of clean water and recreational waterways.

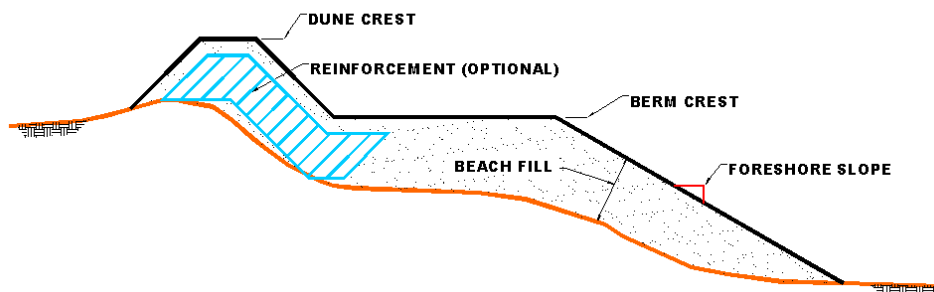
Bayville spends money on consulting, monitoring, testing and installing filter fabric that remove debris and pollutants from wastewater before it is discharged in over 100 storm drains within the Village. This past year the Village was audited by the NYSDEC for MS4 compliance and was given their highest grade.

In seeking funding for protective measures to alleviate flooding, it cannot be denied that the unimpeded flow of storm flood water over the land and then back into Mill Neck Creek is a cause of concern and sets back the hard work done, and money spent, on the Village's goal of protecting its natural resources.

The following sections briefly describe various structural protection techniques considered as elements of a comprehensive erosion control and flood damage prevention solution.

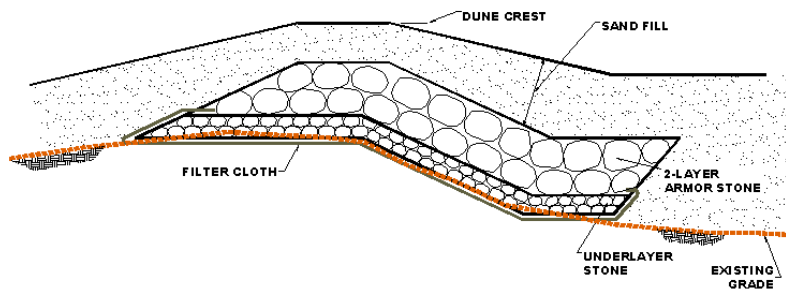
Available Remedies

****Beach Nourishment:** Beach nourishment involves the placement of sand on an eroding shoreline to restore its form and to provide adequate protection. A beach fill typically includes a berm backed by a dune; these elements combine to prevent erosion and inundation damages to leeward areas. Beach nourishment represents a natural method for reducing flooding and erosion damages on the open coast. A typical beach nourishment section is shown in Figure A-1 below. Since the project shoreline is relatively stable with just minor erosion at isolated area, a beachfill alternative is not considered. However, limited beachfill in front of bulkhead and seawall would be applied to increase the toe stability. For a 25 ft dune crest, 1V:5H dune slope, 40 ft wide berm at +11.5 ft NGVD, the cost of beachfill is approximately \$1,200 to 1,500/ft of shoreline.



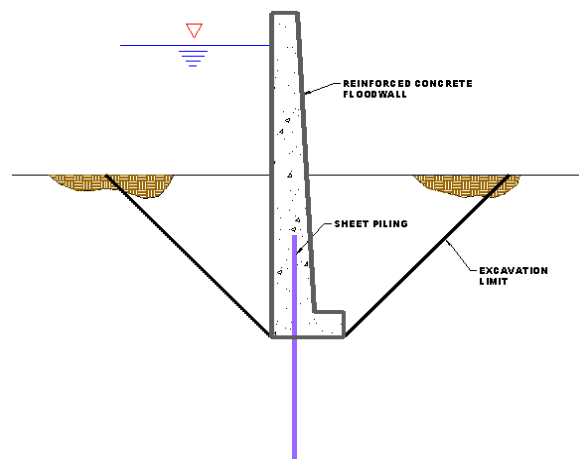
**Figure A-1 Typical Beachfill Section
for Pine Lane**

****Raised and Reinforced Dune with Limited Beachfill:** Reinforced dune is similar to beach nourishment, however, with buried rock, concrete units or geotube reinforcement inside the dune. By setting the crest of the reinforced dune above storm surge elevation would reduce the risk of inundation and wave overtopping. The reinforced dune would prevent dune breaching and limit the landward movement of shoreline after the sand cover is eroded and the buried reinforcement layer is exposed to wave action. A typical rock reinforced dune and beach fill section is illustrated in Figure A-2 below. The cost for a typical reinforced dune is approximately \$1,800 to 2,400/ft including a 25 ft dune crest, 1V:5H dune slope, 25 ft berm width, and 1 Vertical on 10 Horizontal foreshore slope.



**Figure A-2 Typical Dune with Buried Rock Reinforcement Section
for Pine Lane**

****Floodwalls and Levees:** Floodwalls and levees are intended to provide protection against coastal and riverine flooding. These structures can be cost-effective measures against tidal flooding when placed landward of direct wave exposure. Used in this manner, floodwalls and levees provide flood protection to interior structures. While these structures may provide a cost-effective means to prevent flooding of low-lying areas, runoff trapped behind the structure may affect the hydrology and drainage of interior areas. This may alter tidal wetlands and require additional drainage facilities. Floodwalls usually require less footprint than levees. Due to the constraint of limited space at structural foundation, only floodwall is considered for the site. A typical L-type concrete wall is illustrated in Figure A-3. This floodwall includes a vertical reinforced concrete wall section, a L-type foundation, and a sheetpile cut-off wall. This type of wall is relatively stable against static water and small wave runup/overtopping and will be employed along the southern bay front shoreline. A set-back concrete wall without sheetpile cut-off wall can be applied to the L.I. Sound waterfront. A typical concrete “L” shape vertical floodwall with 15-inch thickness and 14 ft crest elevation and a cut-off wall cost approximately \$1,500 to 1,800/ft of shoreline.



**Figure A-3 Typical Concrete Floodwall Section
for President Streets**

****Vertical Flood Fences:** A vinyl coated steel or composite material sheetpile flood fence could be installed along the narrow shoulder of back roads landward of the waterfront structures as shown in Figure A-xx. The advantages of this fence type structure is its relatively small footprint and unnoticeable along residential building backyard. Crest elevations of the fence could be reduced to retain static surge level plus freeboard only due to sheltering effect of structures located seaward of the fence, with reduced wave runoff/overtopping. Structures seaward of the fence could be waterproofed or purchased for public recreation. A typical cantilever steel sheet pile flood fence with 14 ft crest elevation cost approximately \$1,500 to 2,000/ft of shoreline.

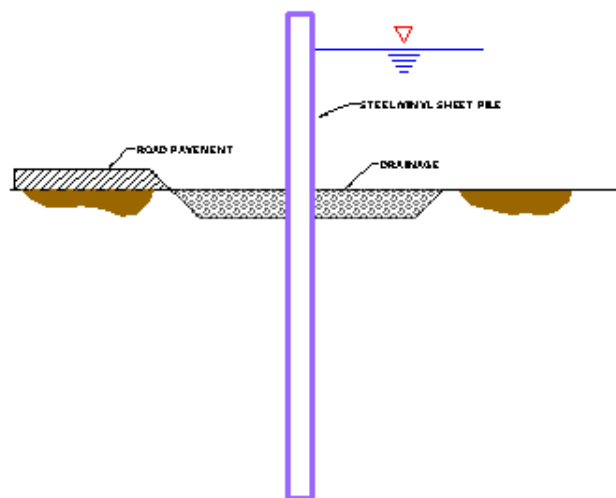


Figure A-xx Typical Sheet Pile Flood Fence Section

for President Streets

****Bulkhead Stabilization:** Bulkhead shore stabilization measures offer both flooding and erosion protection for shorefront structures, and reduce flooding of low-lying interior areas. Bulkhead may be steel, timber, vinyl or composite material completed with tie-backs and rock toe-protections. Beachfill may be added seaward to stabilize and protect the toe. Bulkhead stabilization measures help to reduce effects due to wave action, minimize overtopping floodwaters and limit landward movement of the shoreline. The cost of bulkhead stabilization with riprap toe protection and limited sandfill is approximately \$1,500 to 2,000/ft.

****Raised Berm (Ramp):** The side street landward of the waterfront structure could be raised above surge elevation to protect landward properties from flood inundation. Similar to raised road, the existing ground elevation should not be too low and should have enough space for shoulder and drainage. The raised berm alternative would require lower road surface elevation than the crest elevation of waterfront shore protection structure due to reduced wave runup and overtopping. The raised ramp alternative is also less costly than flood fence, however, requiring wider space. Buildings and structures seaward of the raised ramp would be waterproofed or purchased for public use.

References:

* Reconnaissance Report September 1995

** US Army Corps of Engineers North Shore of Long Island New York Storm Damage and Beach Erosion Feasibility Study

Following are maps, photos and an excerpt from the June 2011 Bayville Record Newsletter

Map 1 Bayville NY

Bayville New York is located on the north shore of Long Island bordered on the north by Long Island Sound and the south by Oyster Bay Harbour and Mill Neck Creek.

Map 2 Bayville Areas Affected by Sandy Floodwaters

Storm surge water flooded the President Streets of the Village and traveled to the eastern end of the Village.

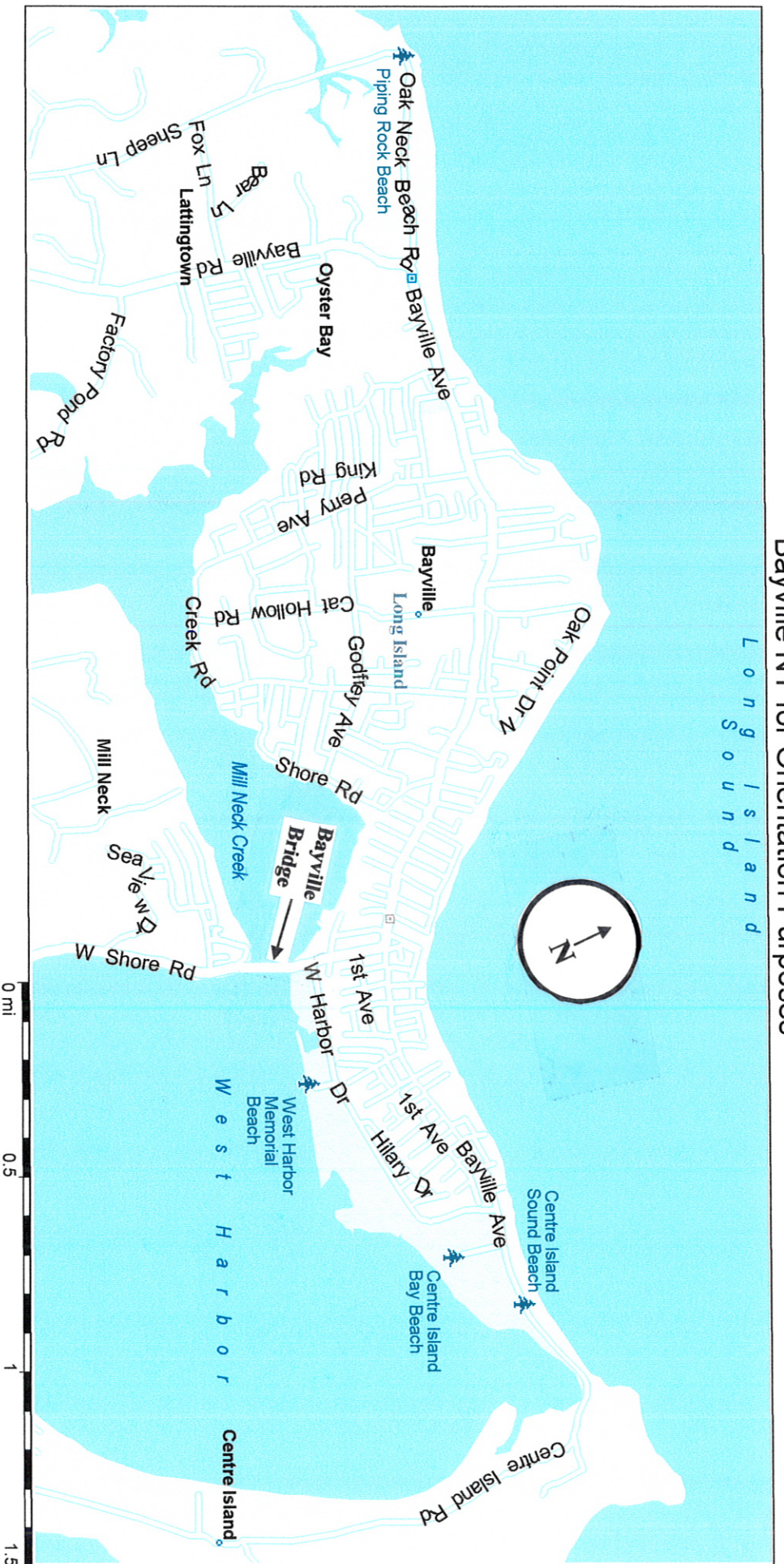
Map 3 President Street Area

Creation of proposed seawall/berm along approximately 2500 feet in Mill Neck Creek to alleviate flood surge.

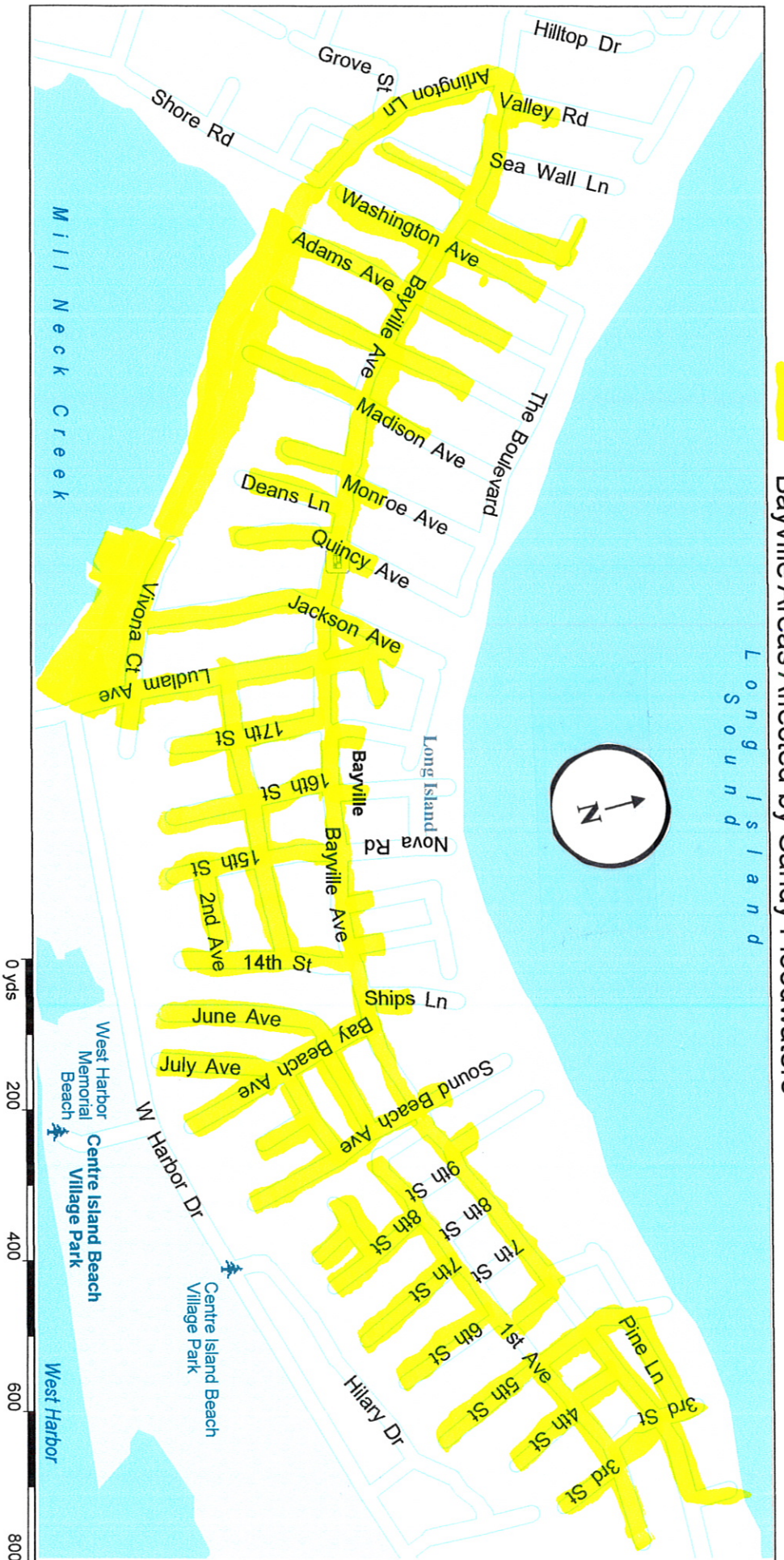
Map 4 Pine Lane Area

Creation of proposed seawall/berm at the entrance to the beach at Pine Lane and First Street to alleviate flood waters caused by northeasterly winds.

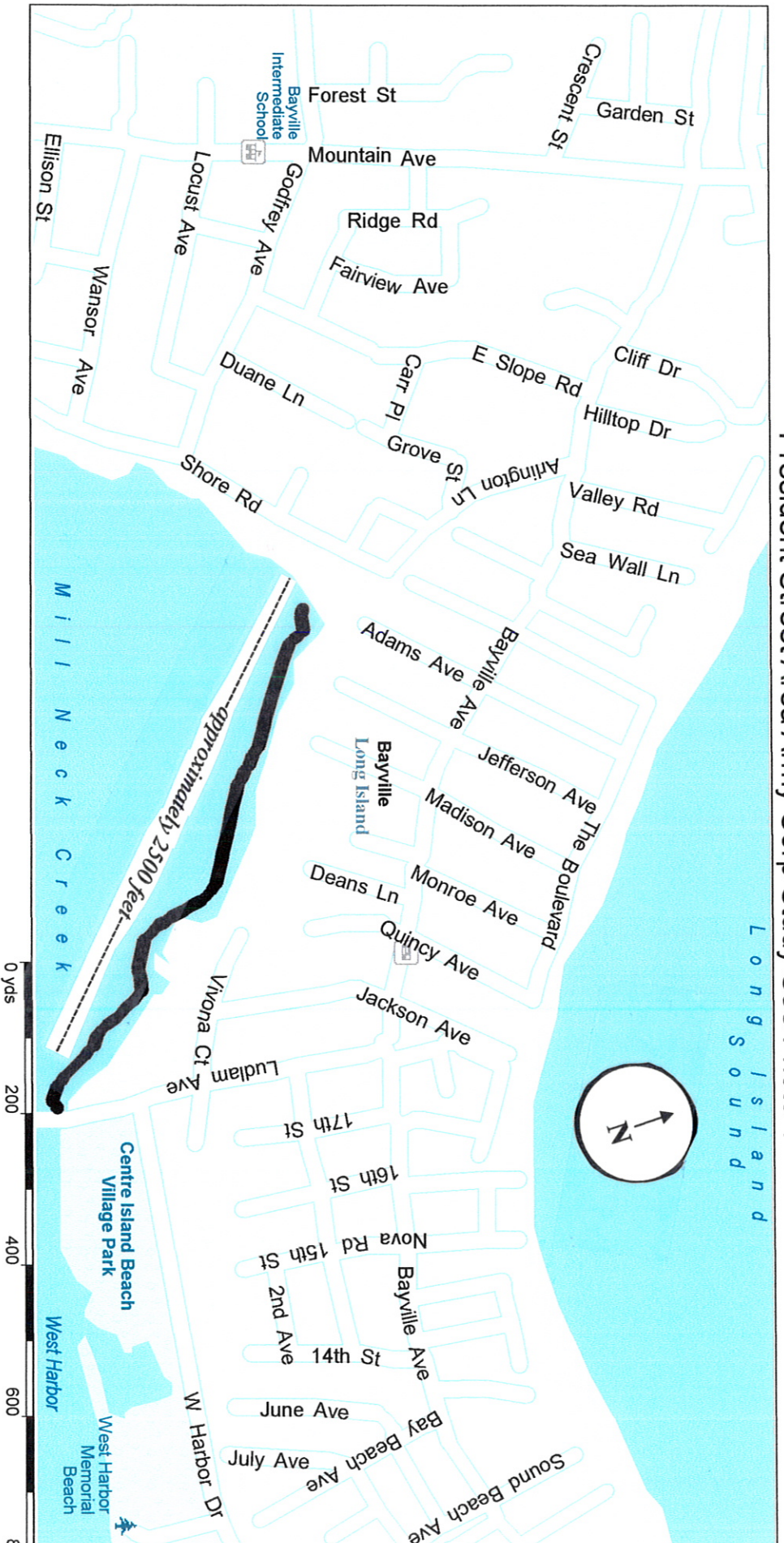
Bayville NY for Orientation Purposes



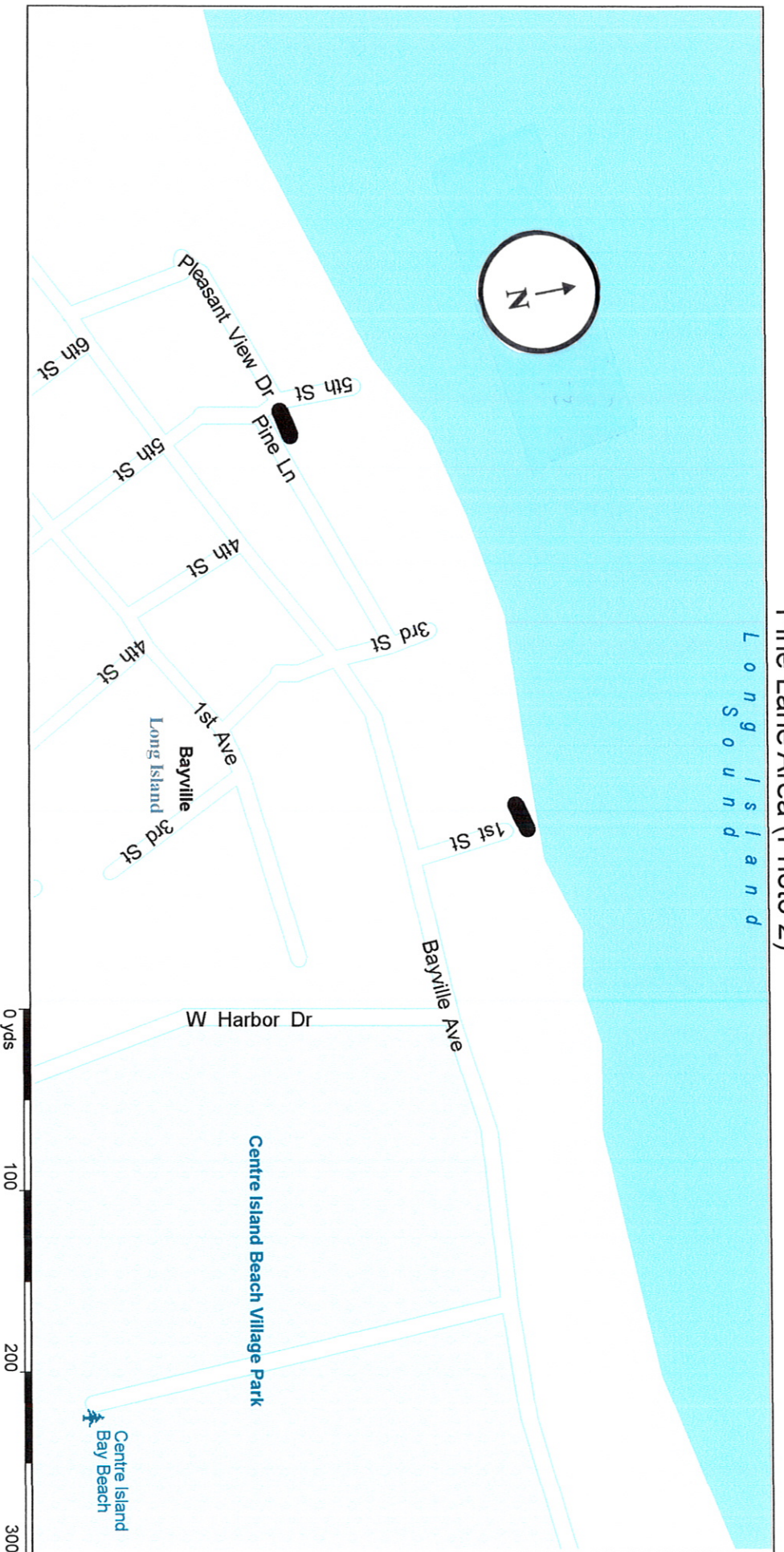
Bayville Areas Affected by Sandy Floodwaters



President Street Area Army Corp Study See Photo 1



Pine Lane Area (Photo 2)



BAYVILLE RECORD – NEWSLETTER – JUNE 2011

Written by Mayor Douglas G. Watson

MS4...IT'S MORE THAN JUST AN UNFUNDED MANDATE, IT'S ACTUALLY NOT A BAD IDEA.

While the MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) is without a doubt a classic example of an unfunded mandate in its purest form, but there is something righteous about it. Remember, an unfunded mandate is when the funding doesn't follow the mandate; this creates a burden to local governments everywhere. The long and short of MS4 reporting consists of a form that must be submitted each year spelling out in great detail, through a myriad of questions, just what the municipality has done concerning control of its stormwater runoff. Here's where the MS4 reporting begins its journey from financial burden to environmental boon. It really is a good idea. Who here in Bayville would argue that tracking our runoff to the Sound, the Bay, and probably most importantly, Mill Neck Creek, is a bad thing?

Knowledge is power and by being forced to examine our actions periodically we gain the ability to ensure that our natural resources are preserved for future generations. The Village of Bayville has been working for years on water quality issues and is ahead of the curve. Starting with a lengthy local waterfront revitalization plan (LWRP), and continuing with drainage projects designed to lessen uncontrolled storm runoff our Village can complete the MS4 reporting requirements with confidence. This is a direct reflection on the hard work of the former Mayor, Board members as well as the professionals retained by the Village to guide us in these matters.

One new area we will be focusing on this year is educating the public. Often taken for granted, public awareness is the most basic place to continue a dialogue on water quality. Going forward we will use our website, this newsletter, and media coverage to raise awareness of this important matter.